



Improved GAU-8/A Ammunition



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Outline

- Project Background
- Ballistically Matched 30mm Family
- Tungsten Armor Piercing (AP) Projectile
 - Design Constraints
 - Approach
 - Results
- Conclusion



Project Background

- Multiyear ATK funded project started in AFY00 to develop an improved family of GAU-8/A ammunition (API, HEI & TP)
- Majority of work addressed replacing DU penetrator in PGU-14 cartridge with tungsten material
 - Analytical work
 - Hardware fabrication
 - Testing
 - Updated analysis
- HEI (PGU-13) cartridge addressed as outgrowth of advanced HEI cartridge design effort



Design Constraints

- All three rounds (AP, TP and HEI) ballistically matched
- Current interface control drawing (ICD) requirements apply
- Current impulse limit applies
 - 117 lb-sec
 - 0.935 lb (424gm) maximum allowable projectile weight
- Gyroscopic stability at worst case launch greater than 1.00
 - Gyroscopic/Dynamic stability for flight duration
- Dispersion requirements – minimize jump sensitivity



Design Constraints

- Maintain current propulsion and ignition system
 - No new propellant development
 - M36 primer
 - Black powder flashtube
- Maintain current aluminum cartridge case
- All designs compatible with current production/LAP equipment and processes
- Typical design dichotomy
 - change as little as possible (i.e. nothing) to keep design risk low and minimize qualification effort yet improve the product



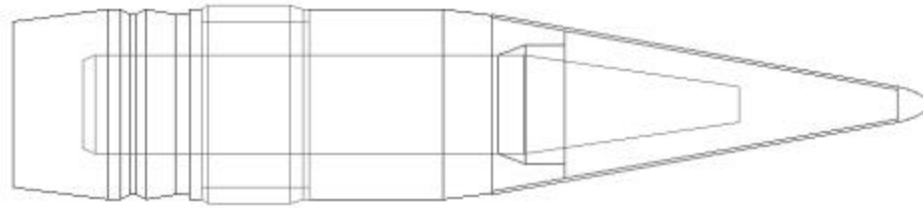
Ballistically Matched Family of Ammunition

- All three rounds (AP, HEI & TP) defined that are ballistically matched
- Armor Piercing (AP) using a tungsten core
 - Penetration testing confirms performance levels
- High Explosive Incendiary (HEI) using an improved mechanical fuze
 - Low drag version of FMU-151 fuze configured
 - FMU-151 fuze has these advantages over the M505 fuze
 - Meets dual safety environments of MIL-STD-1316
 - Better graze and low velocity impact (long range) function than M505
- Target Practice (TP)
 - Essentially no changes to current PGU-15 design

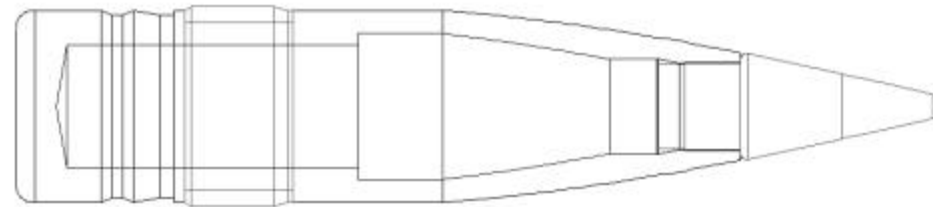


Ballistically Matched Family of Ammunition

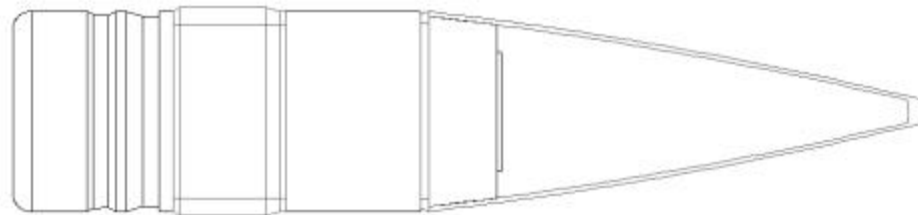
**Tungsten Armor
Piercing Projectile**



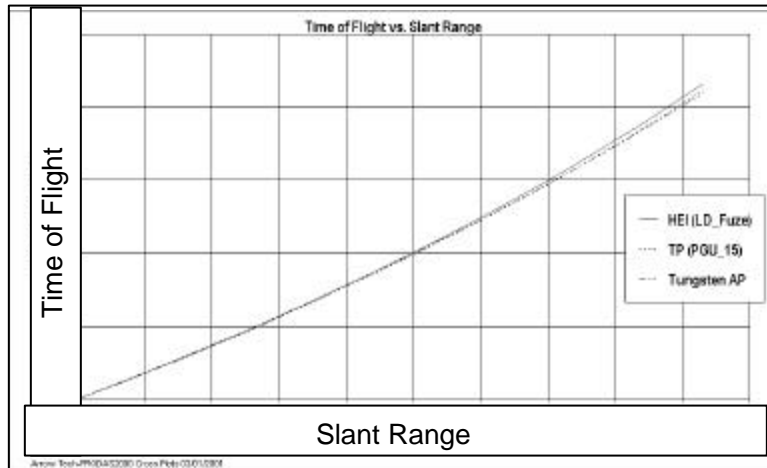
**High Explosive
Incendiary Projectile**



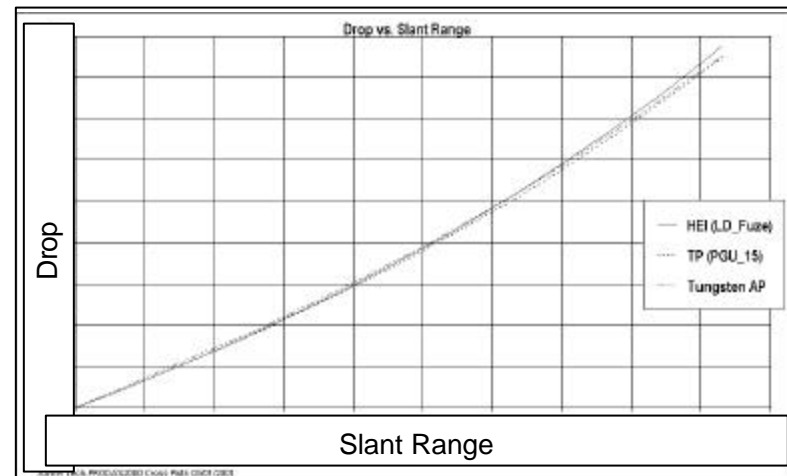
**Target Practice
Projectile**



Ballistically Matched Family of Ammunition



- Initial designs show good ballistic match
 - Similar time of flight and drop
 - Tuning of designs will provide final match



Tungsten AP - Design Goal

Meet the current GAU-8/A API performance requirements using a tungsten core instead of the current DU material



Tungsten AP - Key Performance Parameters

- Debulleting load
- Muzzle velocity
- Chamber pressure (maximum)
- Action time
- Accuracy
- Gyroscopic & Dynamic Stability
- Structural integrity
- Penetration
 - Mass
 - L/D

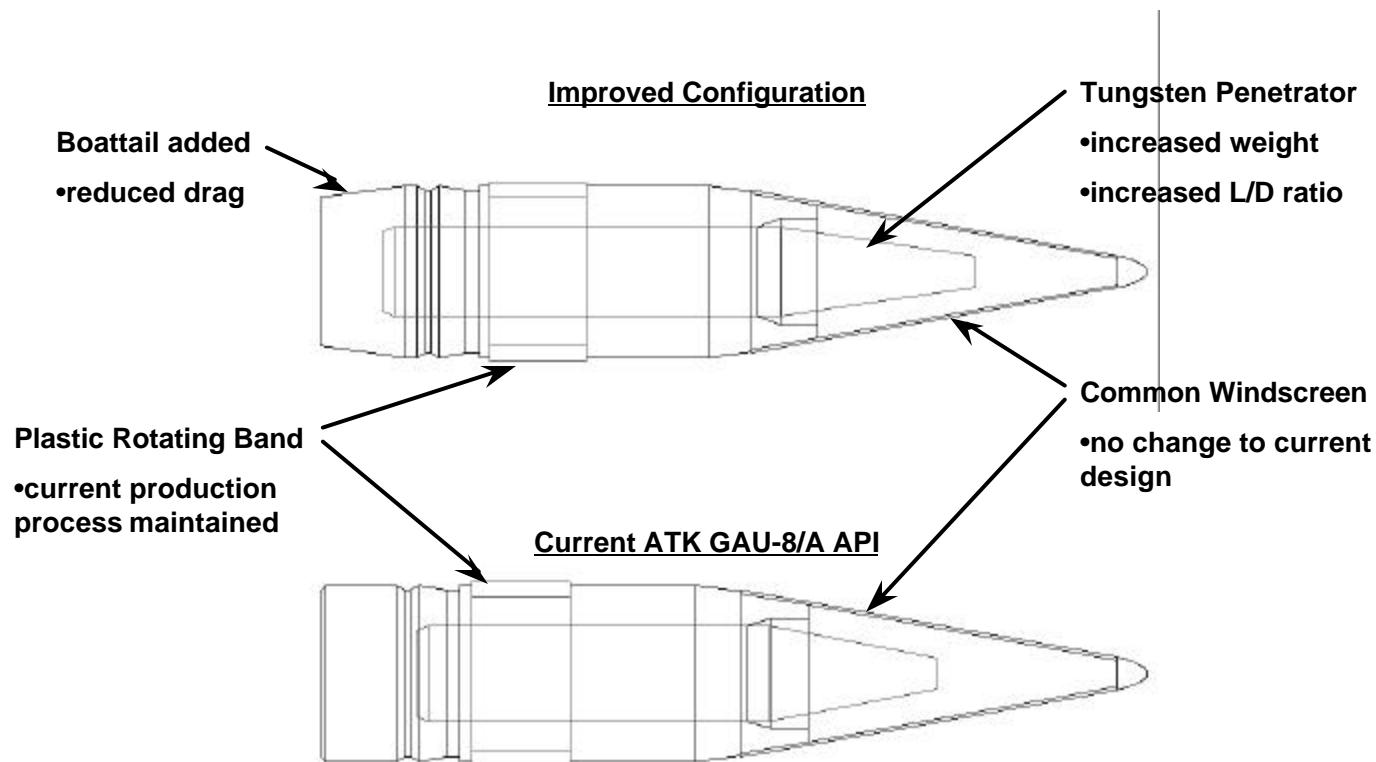


Tungsten AP - Approach for Improved Performance

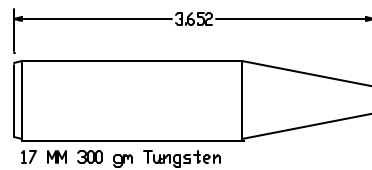
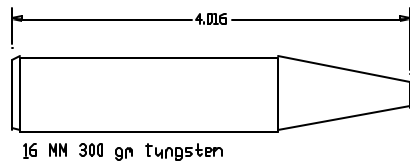
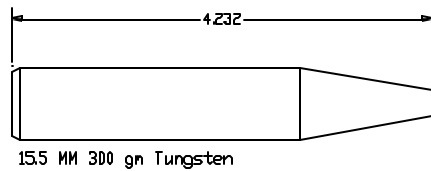
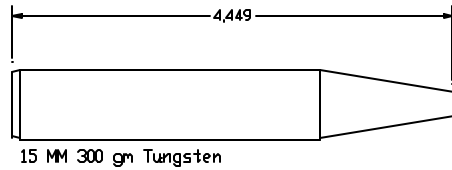
- Extensive computer simulations conducted to identify improved configurations
 - Penetration efficiency
 - Increased penetrator mass and L/D
 - Improved external ballistic effects – Lower Deceleration
 - Reduced drag
 - Increased weight
 - Increased cartridge impulse to ICD limits
 - Current ATK design under allowable impulse level



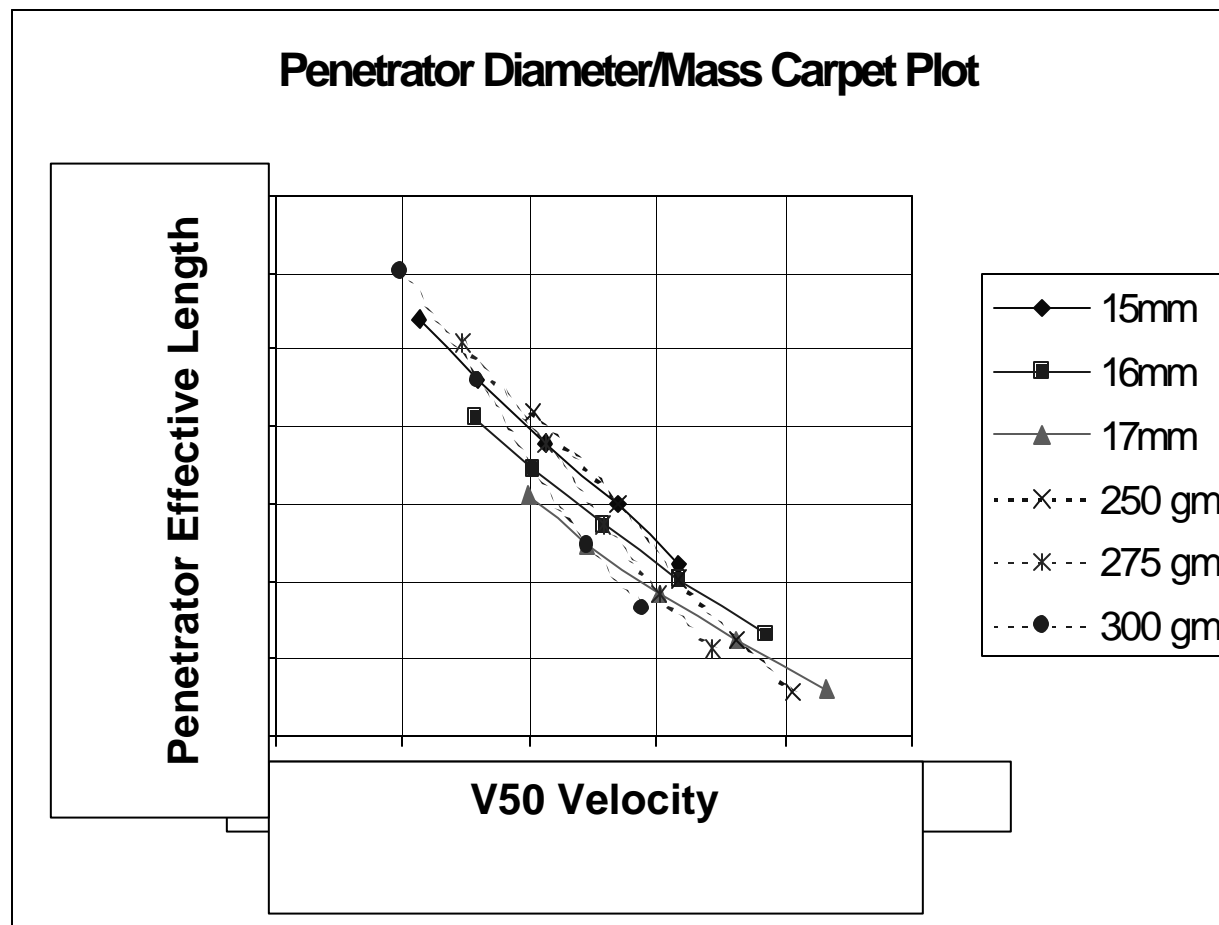
Tungsten AP - Projectile Comparison



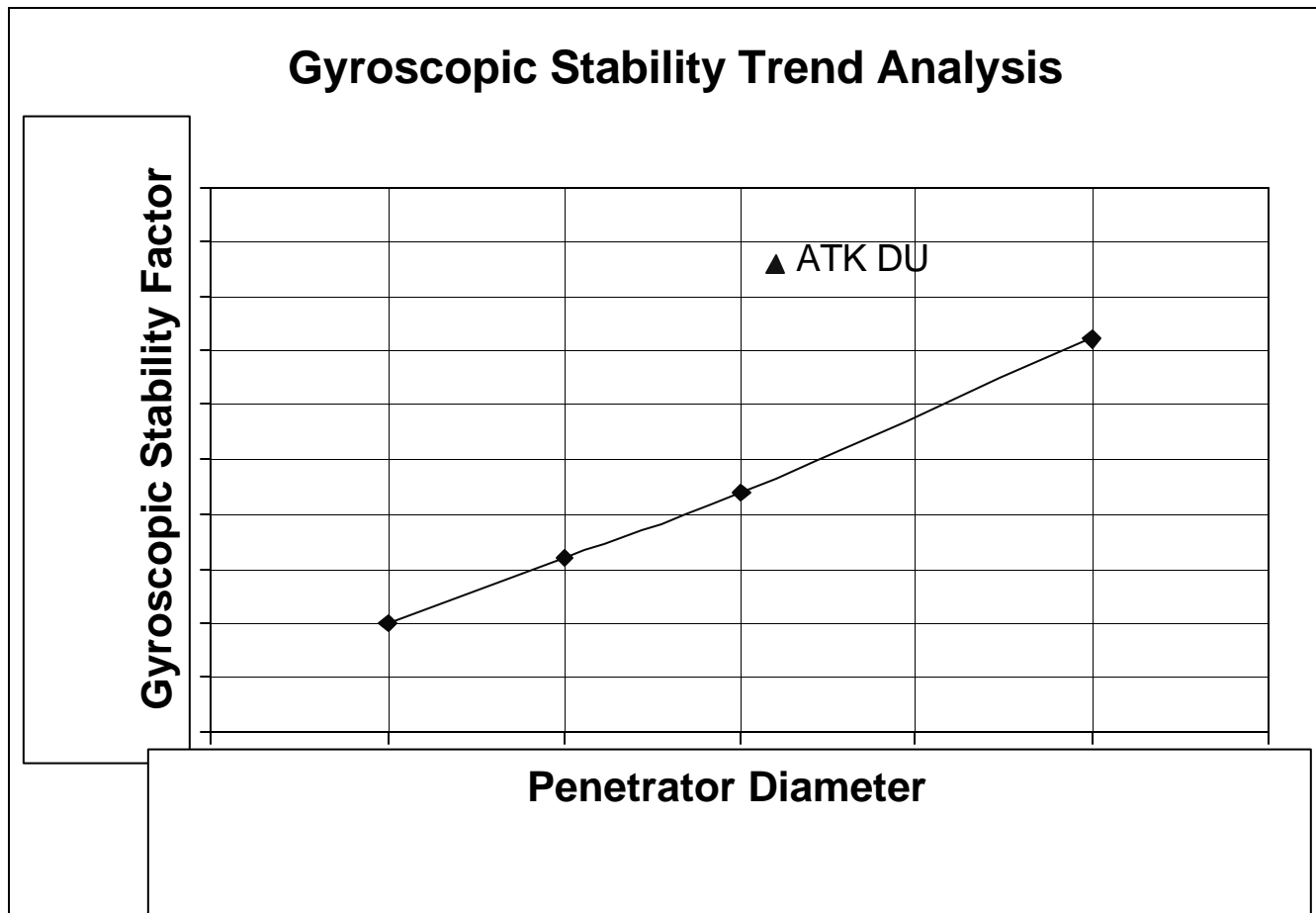
Tungsten AP - Candidate Core Designs



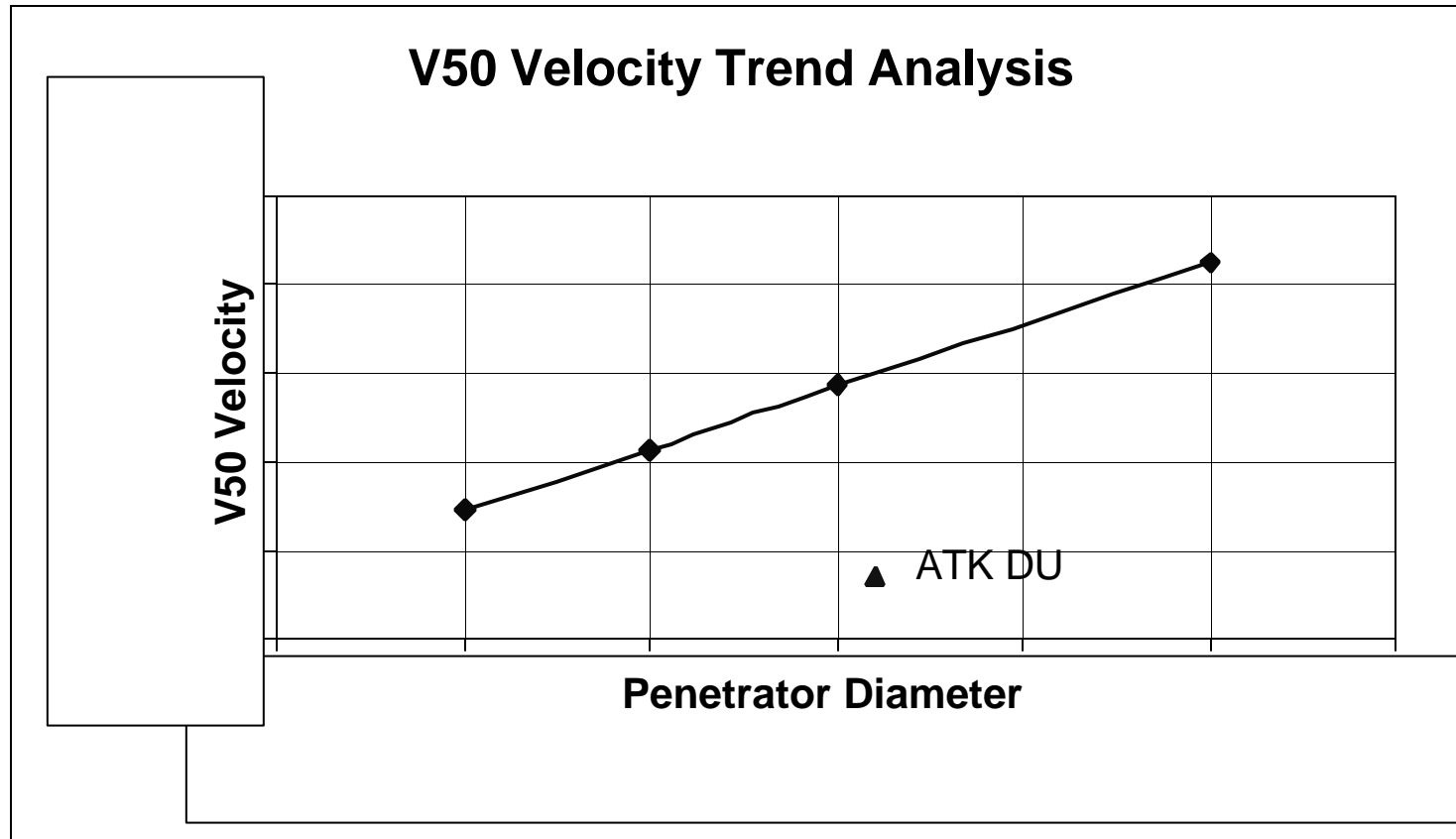
Tungsten AP - Matrix of Candidates



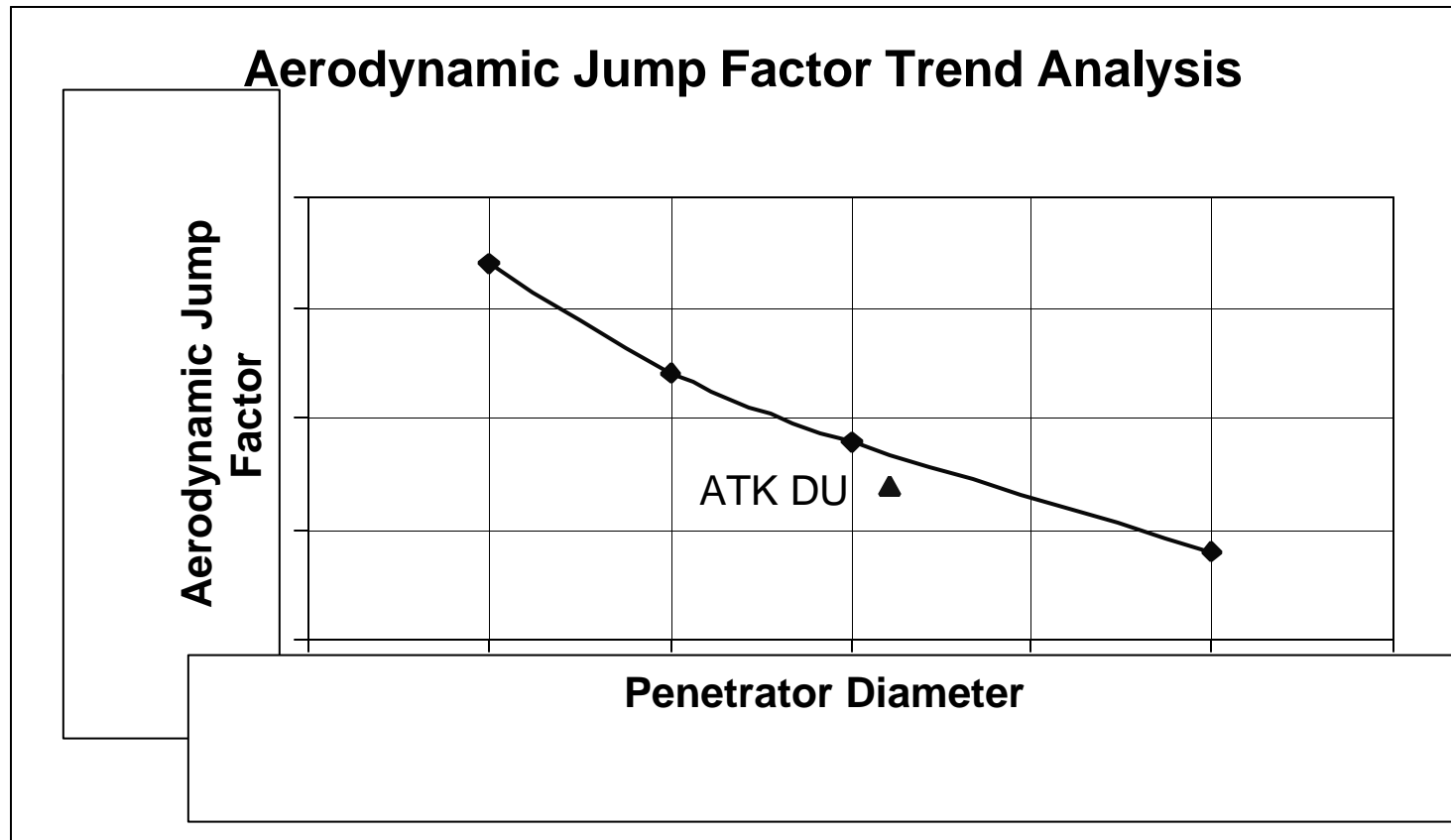
Tungsten AP Stability Trends



Tungsten AP V50 Trends



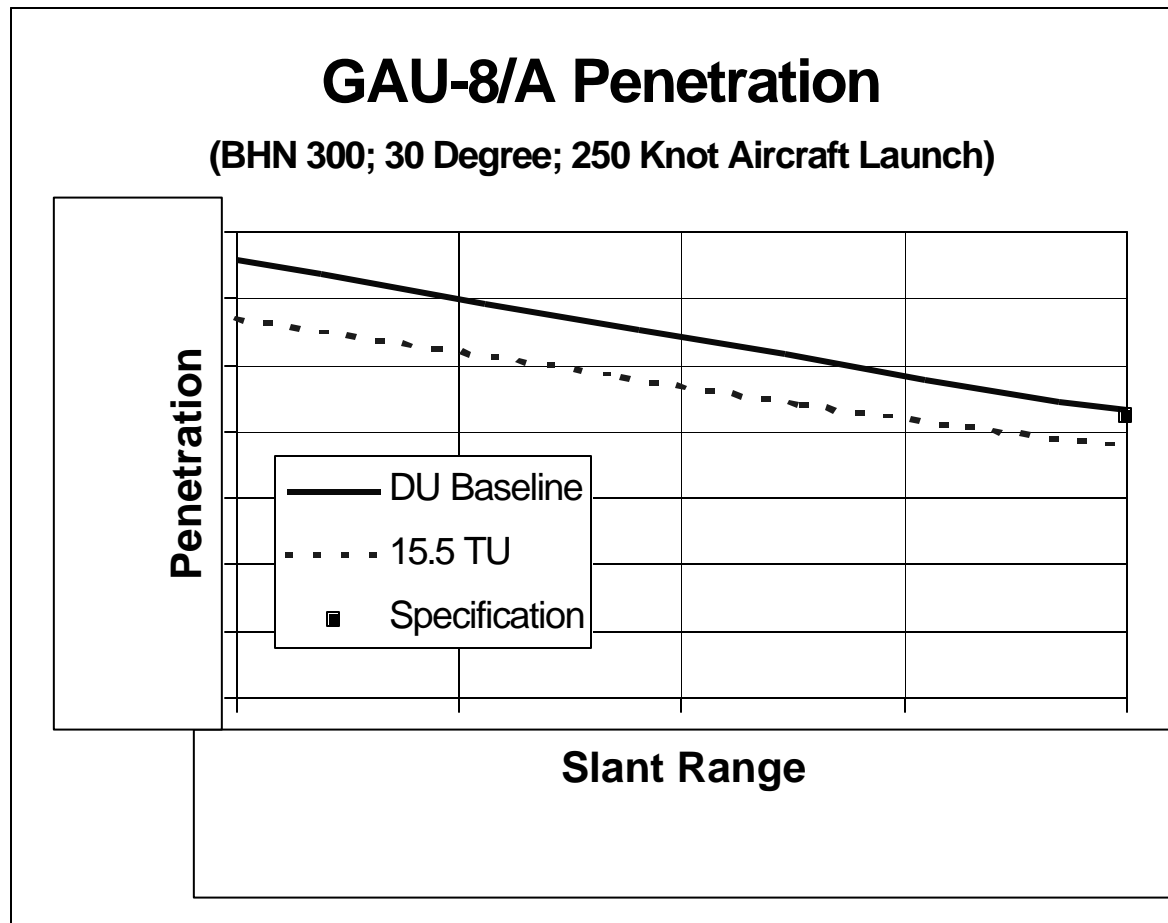
Tungsten AP Aerodynamic Jump Trends



Tungsten AP Air-to-Ground Error



Tungsten AP Penetration Results vs. Current PGU-14

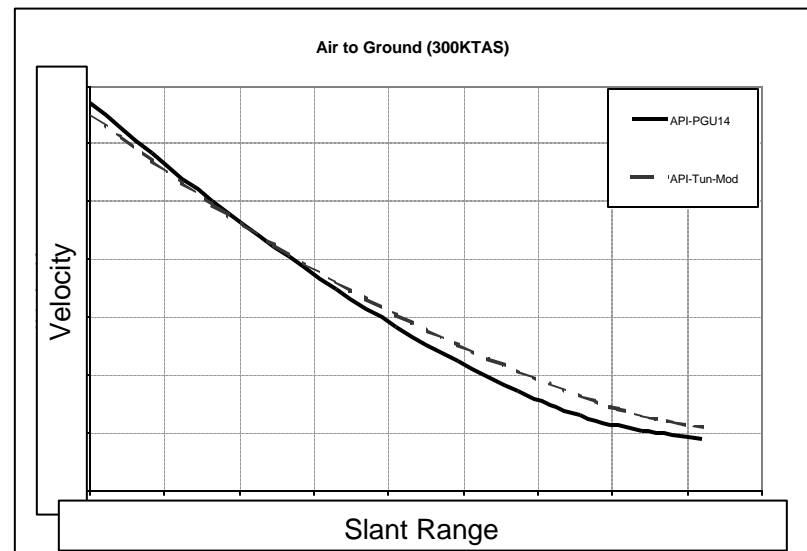


Tungsten AP – Ballistic Comparisons

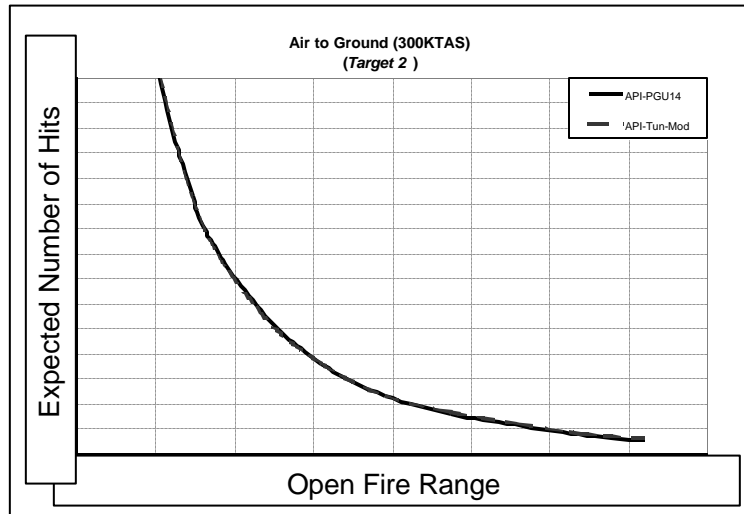


- Lower Drag and Ballistic Coefficient improves ballistic performance versus DU at extended ranges

- Lower time of flight
- Increased strike velocity



Tungsten AP – On Target Performance

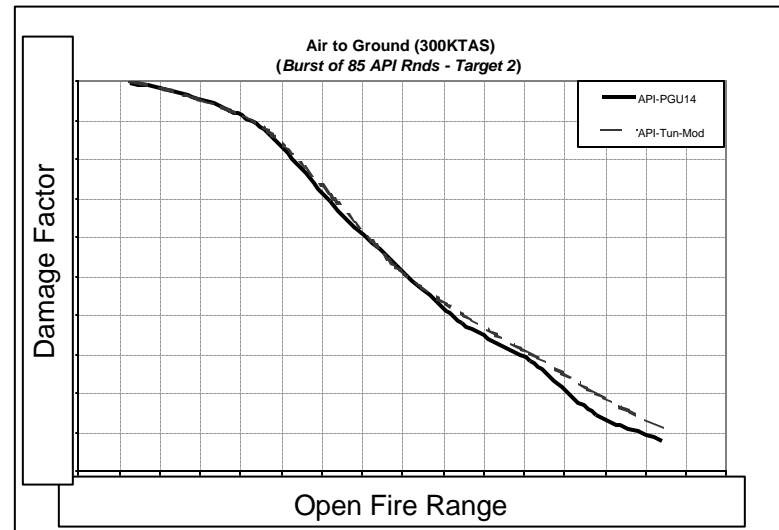


- No difference in number of expected hits

–Tungsten AP versus PGU-14

- Slightly improved damage factor due to higher on target impact velocity

–Tungsten AP versus PGU-14



Improved GAU – 8/A Ammunition - Conclusions

- A ballistically matched family of GAU-8/A ammunition has been defined
- A Tungsten API Alternative to DU has been demonstrated
 - Tactical performance is equivalent to the current DU Round
- An improved HEI has been developed
 - Higher performance fuze
 - Improved safety
 - Improved graze and low velocity impact function
- Rounds are essentially ready for fielding - now

